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ABSTRACT

Public networks are facing ever increasing challenges to keep up with the needs of current and future users. At the same time local and state government support for public networks is declining and pressure to increase services is increasing due to the potential economic development opportunities these kinds of networks can bring about. An exploratory review of the Illinois Century Network using content analysis for the years 2004–2006 of the Advanced Engineering Taskforce reveals that the digital divide issue has not been focused on in the 2005 and 2006 reports. However, an impressive set of significant tasks to improve the network's operation and performance have been accomplished over the last three years. In particular, the increases in bandwidth and network reliability are impressive. Audio and video traffic with low cost Quality of Service has also been added. A major policy question is, given the fact that state support for public networks is generally declining and pressure to increase services is increasing what alternatives exist to fund the expected additional services? Is it time for the private sector to provide financial support for this public network and if so at what cost?

KEYWORDS

Public Networks, E-government, Content Analysis

INTRODUCTION

Public networks are facing ever increasing challenges to keep up with the bandwidth needs of current and future users, to be able to upgrade equipment and maintain reliable and secure networks, to be able to incorporate newer infrastructure such as wireless technology in their networks, and to be able to migrate to next-generation public networks. At the same time, local and state government support for public networks is declining and pressure to increase services is increasing due to the potential economic development opportunities these kinds of networks can bring about. Indeed there are few examples of public projects similar to these networks that states can identify as life-changing initiatives for their citizens and beyond. The Illinois Century Network (ICN) is such an example. This network was a major contributing factor in Illinois being tied with Kansas for the number one rank in the 2001 Digital States

Survey conducted by the Center for Digital Government (www.centerdigitalgov.com). In a similar survey in 1998 and prior to the development of ICN the State of Illinois ranked number 49 among all 50 states. In 2006 both Illinois and Kansas were tied for number nineteen. This annual survey ranks each state on their use of technology to improve government services.

Comment [HAC1]:

The development of high-speed public digital communities, cities, and states, using telecommunications networks began in the United States and around the world more than a decade ago. Examples of such networks include the New York State Advanced Telecommunications Project (Shin 2004; MAGI 2000), the Digital Park of Ireland (www.citywest.ie), the Cyberport of Hong Kong (Cheng and Zheng 2001), the Digital City of Seoul (Goh 2001), and the Multimedia Super Corridor of Malaysia (Lepawsky 2005; Ramasamy et al. 2004). A major aim of these kinds of networks is to deploy advanced technology in economically depressed rural communities to spur economic growth and development and to enhance educational opportunities for residents to be able to participate in and benefit from the digital economy.

In the United States the following states: Alaska, Arkansas, Arizona, Alabama, California, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, Nevada, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Carolina, South Dakota, Texas, Tennessee, Utah, Virginia, Washington, and Wisconsin have created public networks. The Illinois Century Network is one of the largest and most diverse state-governed educational telecommunications backbones in the nation. It provides high speed access to data, audio, and video communication in schools, colleges and universities, public libraries and museums, local and state government agencies, and other state organizations that provide services to Illinois citizens.

The idea behind the creation of the network began in 1997 with the recommendation of the Illinois Higher Education Technology Task Force. The network became a reality in June 1999 with the legislation 20 ILCS 3921, Illinois Century Network Act (amended July, 2002),

> The Illinois Century Network shall build on existing investments in networking schools, colleges, and universities, avoid duplication of future efforts, maintain sufficient capacity to meet the requirements of the participating institutions, and stay current with rapid developments in technology. The Illinois Century Network shall be capable of delivering state-of-the-art access to education, training, and electronic information and shall provide access to networking technologies for institutions located in even the most remote areas of this State. (Illinois Century Network (ICN) Overview)

Creating a teaching, knowledge, and training network were the three main objectives behind the development of ICN. Specifically ICN was created as:

a) A teaching network—to allow colleges and universities the ability to share the expertise of their faculty with students, business leaders, health and education professionals, the farming community and other citizens in an efficient, timely, and cost-effective fashion.

b) A knowledge network—to provide students access to the significant amount of stored knowledge available via various databases and research centers, governmental agencies, digital libraries, museums, and art galleries.

c) A training network—to help and facilitate local and state government employees to upgrade their knowledge and skills and provide them with access and training to state-of-the-art internet tools and technologies.

Illinois Century Network currently provides connectivity consultation, content filtering, DNS hosting, equipment/service discounts, Internet and intranet connectivity, Internet2 access, IP addressing, IP video,

monitoring/analysis, multicasting, Quality of Service (QoS) provision, school to home services and technical support for educational, governmental, and not-for-profit organizations (Illinois Century Network (ICN) Overview). Another significant advantage of this network is the fact that it has been saving the state of Illinois about seven million dollars per year (Marsan 2005) by replacing two outdated and older data networks into a state-of-the-art IP-based high-speed and reliable backbone network providing direct links to institutions, particularly those in rural areas of the state.

The Benefits of Illinois Century Network

The ICN Web site and the 2006 advanced engineering taskforce report highlights the following benefits of the network:

- It serves more than two million Illinois citizens many of them students and state employees
- It provides an IP network to more than 7000 K-20 educational institutions with 99% reliability which allows enhancement in existing classrooms through increased student-to-student and student-to-instructor interactions
- It provides equipment, service, and management in order to light up dark fiber for the Chicago Housing Authority, City of Chicago, Chicago Public Schools, and Chicago Public Library
- It provides the largest bandwidth available to any community college system in the United States to Illinois community colleges
- It provides real time traffic management, network services, upgrades, and repairs on a 24/7/365 basis;
- It provides access to Internet2 to ICN educational constituents, many of whom would either be ineligible for Internet2 access or unable to afford the costs without the ICN, hence enabling Illinois to sustain its competitive advantage in academic computing and networking
- It is a fully multicast network allowing a single stream of video to be replicated at any institution
- It provides access to broadcast quality video transmissions including channels and productions from CSPAN, PBS, NASA, Department of Defense, the Smithsonian Institution, and other locations
- It provides hospitals and burn care units in rural areas of the state with access to critical health care information
- It provides a cost effective resource for institutions migrating from older H.320 standards to newer IP-based H.323 standards video transmission
- It facilitates the delivery of state-of-the-art education and training for business and industry to allow Illinois to compete with other states by creating an attractive environment for rapidly growing network and information related businesses

The Network Governance

The network is governed by a Policy Committee comprised of six standing committee members including the Executive Director of the Board of Higher Education or designee, the Community College Board President or designee, the State Board of Education State Superintendent or designee, the Illinois State Library Director or designee, the Illinois State Museum Director or designee, and the Director of Central Management Services or designee. In addition, the Policy Committee includes up to seven members who are appointed by the Illinois Governor. The Policy Committee is charged to set general policies for the network. It also has specific additional duties and responsibilities related to procurement and acquisition of equipment, contract management, grant management and other fiduciary responsibilities, and personnel management (Illinois Century Network Act—amended July 2002).

RESEARCH QUESTIONS AND METHODOLOGY

The ICN was a major contributing factor in Illinois being tied with Kansas for the number one rank in the 2001 Digital States Survey conducted by the Center for Digital Government (www.centerdigitalgov.com). In a similar survey in 2006 both Illinois and Kansas were tied for number nineteen. The ICN Advanced Engineering Taskforce Reports for the last three years (2004–2006) are analyzed using content analysis to determine any shift or pattern that may exist in setting priorities for the network.

The method of content analysis is a systematic approach that can be used for any form of communication including written reports, speeches, interviews, and images. The method allows the study of contents to collect data to determine its characteristics. For example, the frequency of the most used word in a report may be determined to identify its important communication content.

Content analysis is based on the major assumption that words and phrases can be analyzed in relation to the specific context in which they are used. As such, content analysis starts with looking at the use of phrases, word frequencies, and space measurements in the case of publications, and time counts in terms of communications via radio and television. However, according to Krippendorff (2004), content analysis extends far beyond simple word and phrase frequencies and time measurements. Words and phrases can be analyzed related to the specific context in which they are used.

Before content analysis begins, the content needs to be in a form that can be analyzed. Coding is used for this purpose. The process of coding in content analysis is similar to the coding of a survey instrument. It begins with summarizing content into groups and at the same time classifying similar contents into the same groups to reduce the overall categories of content. In addition, the contents in each group needs to be quite different than the contents in other groups. Philip (1990) cautions that to be able to make reliable inferences from the contents being analyzed, the classification and grouping processes need to be consistent to the point that different individuals code the same content the same way.

Many software programs are now available to facilitate content analysis. Among them are General Inquirer from Harvard University, (General Inquirer), TEXTPACK: A System for Computer-aided Quantitative Content Analysis (http://www.gesis.org/en/software/textpack), and TextSTAT—Simple Text Analysis Tool (TextSTAT).

Holsti (1969) identifies and classifies the purposes of content analysis as follows:

i) to identify implications regarding the past history of a communication
ii) to explain and identify conclusions about the uniqueness of a communication
iii) to identify the general implications of a communication

According to Krippendorff (2004), the following six issues need to be addressed in any content analysis:

i) Which data are analyzed?
ii) How are they defined?
iii) What population the data is drawn from?
iv) What is the context in relation to which the data are analyzed?
v) What are the boundaries of the study?
vi) What is the target of the implications?

We will follow the above steps in this study.

Content Analysis of ICN Advanced Engineering Taskforce Reports (2004-2006)

In this exploratory study we follow steps articulated by Krippendroff (2004) and review the mission statement recommendations, accomplishment statements, and stated challenges included in the last three years (2004–2006) of the ICN Advanced Engineering Taskforce Report to detect any possible patterns.

Recommendations

The following issues appear in the reports for the year(s) stated:

- Strategic Planning: 2004, 2005, 2006
- Equipment Replacement Strategies: 2004, 2005, 2006
- Network Security: 2004, 2005, 2006
- Content Provided: 2004, 2005, 2006
- Digital Divide: 2004
- Community Networking—Private Fiber Networks: 2004
- Cost Recovery Model: 2004, 2005
- Wireless Technologies: 2004, 2005, 2006
- Communication Technologies Coverage—Voice, Video and Data: 2004, 2005, 2006
- State Wide Contracts: 2005, 2006
- Core Technology Infrastructure: 2006
- Network Operations Center: 2006
- Quality of Service Financial Model: 2006
- Staffing Levels/Retention/Development: 2006
- Disaster Recovery/Business Continuity: 2006

Since 2005 the recommendation regarding the digital divide has been dropped. Specifically the 2004 Taskforce Report states: "Although the availability of affordable telecommunication services increases annually, there remain some constituents who have only limited high-priced means by which to connect to ICN." Given that this is still the case ICN needs to re-visit this issue. It is noteworthy to point out that several major initiatives, including staffing development, disaster recovery, and business continuity were added to the set of recommendations in 2006.

Accomplishments

The following issues appear in the reports for the year(s) stated:

- Full range of anytime, anywhere educational opportunities: 2004, 2005, 2006
- Access to Internet2, and access to libraries and museums: 2004, 2005, 2006
- Communication between K–12 to higher education: 2004, 2005, 2006
- Student-to-student and student-to-instructor interaction: 2004, 2005, 2006
- Content sharing among libraries and museums: 2004, 2005, 2006
- Service and educational programming for municipal government: 2004
- Life-long learning at home and work place: 2004
- Online college courses for high school students: 2004
- Online access to college admissions requirements and application process: 2004
- State-wide competitive advantage in computing and networking: 2004
- State-of-the-art education and training for business and industry: 2004
- Growth of network and information related businesses: 2004
- Achieving 99% reliability: 2005, 2006

- Connectivity consultation and DNS hosting: 2005, 2006
- Content filtering: 2005, 2006
- Access to broadcast quality video: 2005, 2006
- Monitoring, support, and troubleshooting 24/7/365: 2005, 2006
- High bandwidth availability (3.8 Gigabits per second): 2005, 2006
- QoS: 2005, 2006
- School to home communication toolkit: 2005, 2006
- Access to education networks worldwide through StarLight: 2005, 2006

It is evident from the list of accomplishments, in particular, over the last two years (2005–2006) that the ICN network has continuously provided additional services to constituents. A major policy question is, given the fact that state support for public networks are generally declining and pressure to increase services is increasing, what alternatives exists to fund the expected additional services?

Challenges

The following issues appear in the yearly reports of the year(s) stated:

- Maintaining a reliable and upgraded network: 2004, 2005, 2006
- Meeting expanding needs of the user community: 2004, 2005, 2006
- Using constituent driven model for planning and management: 2004, 2005, 2006
- Maintaining the appropriate funding level: 2004, 2005, 2006
- Planning for required future services and technologies: 2006

The 2006 Taskforce Report includes a new challenge—planning for future services and technologies. Another noteworthy issue is that in 2005 ICN achieved 99% reliability and additional emphasis is now placed on network and infrastructure security. This may enhance the ability of the network to provide additional services in the future which requires more secure infrastructure and networking technologies.

SUMMARY AND CONCLUSIONS

An exploratory review of the ICN using content analysis for the years 2004–2006 of the Advanced Engineering Taskforce report was conducted to identify any possible patterns in the areas of mission, accomplishments, and challenges the network is facing. It is observed that the digital divide issue has not been focused in the 2005 and 2006 reports. Given that in many rural areas access to higher bandwidth is still limited, it is hoped that this issue will be re-visited again in the future taskforce reports. It is noteworthy to point out that an impressive set of significant tasks have been accomplished over the last three years to improve network operation and performance. The increase in bandwidth and reliability is impressive. Several new services, such as audio and video traffic with low-cost QoS have been added. A major policy question is, given the fact that state support for public networks are generally declining and pressure to increase services is increasing, what alternatives exist to fund the expected additional services? Is it time for the private sector to provide financial support for this public network and if so at what cost?

REFERENCES

Cheng, J. Y. S., and Zheng, P. “Hi-Tech Industries in Hong Kong and the Pearl River Delta: Development Trends in Industrial Cooperation,” *Asian Survey*, (41:4), 2001, pp. 584–610.

General Inquirer. http://www.wjh.harvard.edu/~inquirer, January 22, 2007.
Goh, K. "Seoul's Digital Media City Project—The Bridge between East Asia and the World in the Information Era," 2001, http://english.metro.seoul.kr, January 20, 2007.
Holsti, O. R. *Content Analysis for the Social Sciences and Humanities*, Reading, Mass, 1969.
Illinois Century Network (ICN) Overview, http://www.illinois.net, January 20, 2007.
Kao, L. P. "State Government Networks: Strengthening the Backbone," *Gartner Research Note*, ID Number: VMSL-US-DP-9912, 2000.
Krippendorf, K. *Content Analysis: An Introduction to Its Methodology.* 2nd edition, Sage, Thousand Oaks, CA, 2004.
Lepawsky, J. "Digital Aspirations: Malaysia and the Multimedia Super Corridor," *Focus on Geography* (48:3), 2005, pp.10–18.
MAGI Educational Services. "New York State Advanced Telecommunications Project—Diffusion Fund Program," (2000), http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN002881.pdf, January 15, 2007.
Marsan, C. D. "Illinois Project Saves Millions," *Network World*, http://networkworld.com/news/2005/ 121205-illinois.html, January 15, 2007.
Ramasamy, B., Chakrabarty, A. and Cheah, M. "Malaysia's Leap into the Future: an Evaluation of the Multimedia Super Corridor," *Technovation*, 2004, pp. 871–883.
Shin, D. H. "Public Networks for SME Applications: Implications for Future SME Networks," *Human Systems Management*, (23), 2004, pp.151–159.
TEXTPACK: A System for Computer-aided Quantitative Content Analysis http://www.gesis.org/en/software/ textpack, January 24, 2007.
TextSTAT—Simple Text Analysis Tool. http://www.niederlandistik.fu-berlin.de/textstat/software-en.html, January 24, 2007.
Weber, R. P. *Basic Content Analysis.* 2nd ed., Sage, Newbury Park, CA, 1990.